

## **19.0 LOWER COLUMBIA RIVER COHO ESU**

### **19.1 BACKGROUND**

#### **19.1.1 Description of the ESU**

All naturally produced coho salmon and selected hatchery stocks identified in Table 19.1 are included in the Lower Columbia River (LCR) coho salmon ESU. NMFS has determined that these hatchery stocks reside within the historical geographic range of the ESU and do not exhibit extreme divergence from the local natural populations.

#### **19.1.2 Current Status of the ESU**

In 2001, the BRT reconvened to update information on the biological status of LCR coho and reaffirmed the conclusion that it should be regarded as a separate ESU from SWA coho (NMFS 2001). This conclusion was supported by new tagging data and analyses indicating that SWA and LCR coho populations have differing marine distributions and are genetically distinct (NMFS, 2001). This finding is consistent with the stock structure exhibited by LCR chinook and *O. mykiss* populations (Myers *et al.* 2003). The 2001 BRT also concluded that the historical ESU still exists in the LCR. The primary evidence to support this conclusion is the consistent genetic and life history differences between LCR coho salmon and populations from other areas. The BRT concluded that, because of presumably very low survival rates, stock transfers from Oregon coastal populations 40 to 80 years ago probably had relatively little permanent effect on the genetic makeup of LCR coho salmon. Nevertheless, the BRT recognized that no truly pristine populations persist, and evidence for appreciable natural production is limited to two Oregon populations (in the Sandy and Clackamas rivers) that represent the clearest link (through more or less continuous natural production) to historical populations within the ESU. Based on available information, most of the adult coho salmon returning to natural or hatchery areas outside these two streams appear to have been reared as juveniles in hatcheries or had parents that were reared in hatcheries. The 2001 BRT concluded that, collectively, these hatchery-produced fish contain a significant portion of the historical diversity of LCR coho salmon, albeit in somewhat altered form. In determining the upstream boundary of the LCR coho ESU, the 2001 BRT concluded that Upper Columbia River coho (now extinct) were likely not part of the LCR coho ESU and that the Cascade Crest represents the most likely eastern terminus of the LCR coho ESU. The 2003 Pacific Salmonid BRT did not revisit the 2001 ESU boundary for the LCR coho ESU.

## **19.2 ASSESSMENT OF HATCHERY PROGRAMS**

### **19.2.1 Youngs Bay Coho Population**

#### **19.2.1.1 CEDC (Clatsop Economic Development Commission) Net Pen Coho Program - Youngs Bay**

**19.2.1.1.1 Broodstock History.** Coho production for this program is from the Eagle Creek NFH coho program and the Bonneville Hatchery coho program. Broodstock is collected and reared at these facilities.

**19.2.1.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** The coho program is designed to be isolated from the reference population. This program supports a terminal fishery targeting returning coho salmon.

**19.2.1.1.3 Program Design.** The purpose of this program is to support commercial and recreational terminal fisheries that will allow for greater harvest opportunities while minimizing impacts to listed salmon species. This program is part of the Select Area Fisheries Evaluation Project (SAFE). Early-run coho are either reared over winter or for a two-week acclimation prior to release at the net pen sites in Youngs Bay. The production goal, at present, is 1,700,000 smolts released from the Youngs Bay net pens (Miller et al. 2002). The production comes from the Bonneville Coho Program (Oxbow, Cascade, Bonneville facilities) and Eagle Creek NFH coho program. All production is 100-percent adipose fin-clipped. All production releases have a group that is CWT for evaluation. Production is expected to decline due to funding cuts that have shifted production away from the Youngs Bay and SAFE program.

**19.2.1.1.4 Program Performance.** In 2002, the spawning ground surveys in Youngs Bay estimated that the escapement was primarily marked fish and that 8.5 percent of the spawners were of natural origin (Brown *et al.* 2003). The smolt-to-adult survival rate has averaged 2.3 percent for coho salmon released from the net pens for the 1993 to 1997 broodyears. The commercial coho harvest in Youngs Bay averaged over 19,600 from 1996 to 2000. Harvest increased to 51,859 in 2002 and 94,279 in 2003 (WDFW and ODFW 2003). Coho releases ended in the Klaskanine River in 2002. The number of natural spawning coho is expected to decline from the 230 observed in 2003.

**19.2.1.1.5 VSP Effects.** The net effect of this program on the reference population is uncertain. Most of the naturally spawning coho salmon are marked hatchery fish, and the small proportion of the naturally spawning population that are unmarked are progeny of hatchery coho. Peak spawning counts for coho were near zero for most of the 1980s and 1990s.

#### **19.2.1.2 Astoria High School (STEP) Coho Fry Program. (Big Creek Hatchery Coho) and Warrenton High School (STEP) Coho Fry Program. (Big Creek Hatchery Coho)**

**19.2.1.2.1 Broodstock History.** The eggs for these programs are from the Big Creek Hatchery coho program and are not part of the Youngs Bay population, though they are still part of the LCR chinook salmon ESU.

**19.2.1.2.2 Similarity between Hatchery-origin and Natural-origin Fish.** The eggs are derived from coho returning to Big Creek Hatchery and are not integrated with the reference population.

**19.2.1.2.3 Program Design.** These are two small educational programs at the two high schools. The Warrenton program releases fish into the Skipanon River (a tributary to Youngs Bay), and the Astoria program releases fish into the Youngs River. These have been ongoing programs. The Astoria program started in the early 1990s and the Warrenton program in 1996. The eggs are part of a stock that is integrated with the Big Creek population of coho salmon but is not part of the Youngs Bay population. The Astoria program and the Warrenton program release 5,000 and 7,500 fry, respectively. These programs are not expected to affect the Youngs Bay coho population. There are no plans to change the source of eggs for this program to coho salmon from Youngs Bay.

**19.2.1.2.4 Program Performance.** The Skipanon River is not surveyed for coho, so it is unknown if this program is producing returning adults. The fish released from these programs are not marked, so it cannot be determined if Youngs River releases are contributing to adult returns. This program is funded through the Mitchell Act and ODFW. The continuation of this program is dependent on Mitchell Act funding.

**19.2.1.2.5 VSP Effects.** These programs are primarily for educational purposes and are not expected to increase abundances. There is the potential for loss of diversity if these program fish from the Big Creek population survive to contribute to the naturally reproducing coho salmon in Youngs Bay.

## **19.2.2 Grays River Coho Population**

### **19.2.2.1 Grays River Type-S Coho Program**

#### **19.2.2.1.1 Broodstock History**

The broodstock is Type-S coho from returns to the Grays River Hatchery or, if there is a program shortfall, Type-S coho from the North Toutle Hatchery.

**19.2.2.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** Program fish may not be representative of the later spawning historical population.

**19.2.2.1.3 Program Design.** The goal of this program is to contribute to harvest in the lower Columbia River/Estuary as mitigation for hydro-system development and habitat loss. This program is part of the SAFE project. The production goal is for an annual release of 150,000 smolts on-station. All of the program fish are marked with an adipose fin clip to allow for selective fisheries and assessment of straying and interactions with naturally spawning populations. This program supports coho releases at the Deep River and Steamboat Slough net pens.

**19.2.2.1.4 Program Performance.** The stray rate for this program has not been determined, as spawning ground surveys for coho salmon are conducted incidental to surveys for chinook and chum salmon, so natural coho production information is very limited. The average smolt-to-adult

survival rate for coho salmon was estimated to be 2.55 percent for the 1996-98 broodyears, a vast improvement over the 1990 to 1994 broodyear average of less than 0.5 percent (APRE report). Returns to the hatchery averaged 4,245 from 1999-2003, with a range from 12,910 in 2000 to 520 in 2003 (WDFW Hatchery Return Data). The Grays River Hatchery was a Mitchell Act-funded facility, and all production is funded by BPA to support the Deep River and Steamboat Slough net pen programs.

**19.2.2.1.5 VSP Effects.** The net effect of this program is unknown. The program may be detrimental to the diversity of the reference population, because the current program coho may not represent the later spawning historical population and also because of the use of North Toutle Type-S coho from outside the reference population.

#### **19.2.2.2 Sea Resources Type-S Coho Program**

**19.2.2.2.1 Broodstock History.** Adults are from volitional returns to the Sea Resources weir on the Chinook River. Grays River Hatchery stock has been used in the past to supplement production.

**19.2.2.2.2 Similarity between Hatchery-origin and Natural-origin Fish.** There has not been a genetic evaluation to determine if the returns to the Chinook River group together with the Grays River population, but the program collects adults from throughout the run and thus should be representative of the naturally spawning adults in the Chinook River.

**19.2.2.2.3 Program Design.** This is a conservation program with the goal of supplementing the natural population in the Chinook River and to support education and research activities. The broodstock goal is to collect no more than 50 percent of the returning adults, passing the rest upstream of the weir to spawn naturally. The production goal is an annual release of 52,500 smolts, a reduction from the past release goal. The reduction reflects a change in program goals from production for harvest to recovery/supplementation. Since the 2000 brood, all production has been adipose fin-clipped to allow for monitoring adult returns.

**19.2.2.2.4 Program Performance.** The stray rate and smolt-to-adult survival rate has not been estimated for this program. The return of coho salmon has varied greatly from a high of 575 in 2002 to a low of 17 in 1998 (Warren 2004). The average return for that period was 221 adults. It is currently unknown what proportion of the naturally spawning population is program fish. The program is funded through state and Federal grants and community donations.

**19.2.2.2.5 VSP Effects.** This program has been shown to increase the number of coho returning to the Chinook River. It is uncertain if the new program approach will increase the natural production of coho salmon that has been curtailed by the degraded habitat in the Chinook River. It is also unknown if the early returning (Type-S) coho are representative of the historical natural spawning population. This program may also support the spatial distribution of the Grays River coho population.

### **19.2.2.3 Peterson Coho Project (Fry Release) Program (Sea Resources Stock)**

**19.2.2.3.1 Broodstock History.** Fry for this program originate from the Sea Resources Hatchery coho program.

**19.2.2.3.2 Similarity between Hatchery-origin and Natural-origin Fish.** This is a program to reestablish natural production into recently re-opened habitat. There are no natural spawning coho at this location.

**19.2.2.3.3 Program Design.** The is a short, 3-year program to reestablish natural production of coho salmon in an independent tributary to the Columbia River upstream of the Chinook River. A culvert has been replaced that allows for volitional passage into the creek. The release goal is 5,000 fry. The only monitoring and evaluation will be presence of adult coho. An alternative in the future would be to outplant adults instead of fry.

**19.2.2.3.4 Program Performance.** The program is new and has not yet produced adult returns.

**19.2.2.3.5 VSP Effects.** The net effect of this small program may be to increase the spatial distribution of the reference population through the reintroduction of coho into newly opened habitat.

### **19.2.2.4 Deep River Net Pens Type-S Coho Program**

**19.2.2.4.1 Broodstock History.** Coho production released at the Deep River net pens are from broodstock collected at the Grays River Hatchery or the North Toutle Hatchery.

**19.2.2.4.2 Similarity between Hatchery-origin and Natural-origin Fish.** This program releases Type-S coho and may not be representative of the later spawning populations that were present historically.

**19.2.2.4.3 Program Design.** The purpose of the program is to support harvest in the lower Columbia River and Estuary as mitigation for hydro-system development and habitat loss. This program is part of the SAFE project. The current production goal is an annual release of 350,000 smolts. There are two net pen sites (upper Rkm 8.1 and lower Rkm 6.4) where coho are reared from November to release in late April to mid-May. Releases occur after naturally produced chum salmon have emigrated out of the basin. All the fish are given an adipose fin clip to allow for selective fisheries and to assess straying and interactions with naturally produced coho. Harvest rates have not been as high as desired, and prices for coho have been low. It has been proposed that coho programs be eliminated and replaced with additional spring chinook production.

**19.2.2.4.4 Program Performance.** Stray rates have not been estimated for this program, but CWT program coho have been recovered in the Deep River and Grays River basins. Approximately 2.4 percent of all CWT recoveries were at Grays River (86) and Big Creek (4) and on the spawning grounds (14) (Miller *et al.* 2002). The smolt-to-adult survival rate averaged 2.8 percent for the Deep River net pen releases. The harvest of coho from the program averaged

over 3,500 from 1996 to 2000, with a peak harvest of 13,392 in 2000 (Miller *et al.* 2002). This program is funded by BPA and is up for review in 2004.

**19.2.2.4.5 VSP Effects.** The net effect is uncertain, as the number of program coho that are naturally spawning is unknown. The program may be detrimental to the diversity of the reference population, because the current program coho may not represent the later spawning historical population and also because of the use of North Toutle Type-S coho from outside the reference population.

### **19.2.3 Big Creek Coho Population**

#### **19.2.3.1 Big Creek Hatchery Coho Program**

**19.2.3.1.1 Broodstock History.** Broodstock for this program are from returns to the hatchery. Very few transfers have occurred in the past, and all of these were from in-ESU populations (the last release was from the Bonneville Hatchery in 1984).

**19.2.3.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** There is very little spawning habitat in Big Creek below the hatchery weir, and in the past, hatchery coho were not marked so it is unknown if naturally produced coho were incorporated into the population.

**19.2.3.1.3 Program Design.** The program goal is to provide fisheries for coho in the lower Columbia River as mitigation for hydro-system development and habitat loss. The production goal is for an annual release of 535,000 smolts (APRE reports). All production is 100-percent adipose fin-clipped to allow for selective fisheries. All production is released on-station. In the past coho salmon were not released above the weir due to disease concerns. Currently unmarked coho salmon are passed above the weir to spawn naturally. The hatchery intake is currently not up to NOAA Fisheries criteria and needs improvements.

**19.2.3.1.4 Program Performance.** Stray rates have not been estimated for this program. The estimated proportion of marked hatchery in the spawning population for the lower Columbia River tributaries including Big Creek and those in Youngs Bay was over 90 percent, with only 8.6 percent being considered natural-origin coho salmon (Brown *et al.* 2003). Beginning in 2002, unmarked coho have been passed above the weir to seed unused habitat and to meet ODFW policy. In 2002, 73 unmarked coho were passed upstream. This number increased to 331 in 2003. The averaged smolt-to-adult survival rate was 0.79 percent for the 1994-98 broodyears (APRE reports). Returns to the hatchery have averaged 6,416 from 1999-2003 and ranged from 1,684 in 1999 to 10,047 in 2001 (OPITT 2004). The program fish are thought to be representative of the historical population (WLC TRT Dec. 3, 2003). The continuation of this program is dependent on Mitchell Act funding.

**19.2.3.1.5 VSP Effects.** The net effect of this program is unknown, but it has increased the number of naturally spawning coho. Most of the naturally produced coho are probably second-generation hatchery fish, though marking of all hatchery production should allow for assessment of natural production.

### **19.2.3.2 CEDC Net Pen Coho Program - Tongue Point and Blind Slough**

**19.2.3.2.1 Broodstock History.** Coho production for this program is from the Eagle Creek NFH coho program and the Sandy Hatchery coho program. Broodstock is collected and reared at these facilities.

**19.2.3.2.2 Similarity between Hatchery-origin and Natural-origin Fish.** The coho program is designed to be isolated from the reference population. This program supports a terminal fishery targeting returning coho salmon.

**19.2.3.2.3 Program Design.** The purpose of this program is to support commercial and recreational terminal fisheries that will allow for greater harvest opportunities while minimizing impacts to listed salmon species. This program is part of the SAFE project. Early-run coho are either reared over winter or for a two-week acclimation period prior to release at the net pen sites at Tongue Point and Blind Slough. The production goal, at present, is approximately 1.0 million smolts released from the net pens. The production comes from the Sandy River Hatchery and Eagle Creek NFH coho programs. All production is 100-percent adipose fin-clipped. All production releases have a group that is CWT for evaluation. Production is expected to decline due to funding cuts that have shifted production away from the SAFE program. Tongue Point net pens are being moved to a new location further upstream from the Columbia River mainstem into Cathlamette Bay. This was primarily due to straying problems associated with the spring chinook program, but it should benefit the coho program as well.

**19.2.3.2.4 Program Performance.** In 2002, spawning ground surveys indicated that the escapement was primarily marked fish and that 8.6 percent of the spawners were of natural origin (Brown *et al.* 2003). Smolt-to-adult survival rates for the 1993 to 1997 broodyears averaged 1.9 percent and 1.4 percent for coho salmon released from the Tongue Point and Blind Slough net pens, respectively. The commercial coho harvest in Tongue Point averaged over 4,100 from 1996 to 2000. Harvest increased to 15,560 in 2002 and 15,598 in 2003 (WDFW and ODFW 2003). The commercial coho harvest at the Blind Slough net pens averaged 1,975 from 1996 to 2000. Harvest increased to 3,816 in 2003. This program is funded by BPA and is up for review in 2004.

**19.2.3.2.5 VSP Effects.** The net effect of this program on the reference population is uncertain. Most of the naturally spawning coho salmon are marked hatchery fish, and the small proportion of the naturally spawning population that is unmarked are progeny of hatchery coho. Peak spawning counts for coho were near zero for most of the 1980s and 1990s.

### **19.2.4 Elochoman River Coho Population**

#### **19.2.4.1 Elochoman Type-S Coho Program**

**19.2.4.1.1 Broodstock History.** Broodstock are from returns to the hatchery, and in recent years, Type-S coho have also been transferred in from the Grays River, Kalama, and North Toutle hatcheries (1996-2001).

**19.2.4.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** The program is managed as an isolated program. The Type-S coho are not representative of the historical population, which was considered to be late-returning.

**19.2.4.1.3 Program Design.** The goal of this program is to provide harvest of Type-S coho in the Elochoman River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss. Broodstock are collected as they volunteer into the fish ladder trap at the lower end of the Elochoman Hatchery, adjacent to a permanent barrier dam across the Elochoman River (the barrier dam is passable during high flows). The production goal is an annual release of 418,000 smolts. All production is 100-percent adipose fin-clipped to allow for selective fisheries. The coho are reared and released on-station, with releases commencing after it is determined that naturally produced chum salmon have emigrated from the area. The hatchery rears both Type-S and Type-N coho salmon, and maintaining segregation of the two programs is an issue. WDFW is considering changes to this program, including elimination of the Type-S program or developing a stock that either covers the entire return (i.e., combining the two types into one) or is based on the run timing of naturally produced coho salmon that return to the basin.

**19.2.4.1.4 Program Performance.** Stray rates have not been estimated for this program, but WDFW estimates that over 30 percent of the naturally spawning coho salmon are hatchery fish. Smolt-to-adult returns averaged only 0.23 percent for the 1993 to 1997 broodyears (APRE reports). Returns to the hatchery have improved and have averaged over 6,927 from 1999 to 2003 (OPITT 2004). The Type-S early returning fish are probably not representative of the what was present historically in the basin. The continuation of this program is dependent on Mitchell Act funding. The barrier dam is in need of repair to make it impassable at high flows, thereby allowing for monitoring of coho passage and escapement into the upper Elochoman River. The intake structure for the Elochoman Hatchery also needs to be upgraded to meet NOAA Fisheries criteria.

**19.2.4.1.5 VSP Effects.** The net effects of the program are unknown but probably negative. Most naturally produced coho salmon are probably second-generation hatchery coho. The program was developed using non-local coho stock and does not represent return timing of the historical population. Segregation of early and late stocks of coho at the hatchery is also a concern.

#### **19.2.4.2 Elochoman Type-N Coho Program**

**19.2.4.2.1 Broodstock History.** Broodstock are from returns to the hatchery, and in recent years, Type-N coho have also been transferred in from the Lewis River Hatchery.

**19.2.4.2.2 Similarity between Hatchery-origin and Natural-origin Fish.** The long-term goal is for the program to be integrated, though naturally produced adults are not incorporated into the broodstock, and for more than 30 percent of the naturally spawning population to be hatchery coho salmon.

**19.2.4.2.3 Program Design.** The goal of this program is to provide harvest of Type-N coho in the Elochoman River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for



hydro-system development and habitat loss. Broodstock are collected as they volunteer into the fish ladder trap at the lower end of the Elochoman Hatchery, adjacent to a permanent barrier dam across the Elochoman River (the barrier dam is passable during high flows). The production goal is an annual release of 500,000 smolts. All production is 100-percent adipose fin-clipped to allow for selective fisheries. The coho are reared and released on-station with releases commencing after it is determined that naturally produced chum salmon have emigrated from the area. The hatchery rears both Type-S and Type-N coho salmon, and maintaining segregation of the two programs is an issue. WDFW is considering changes to this program, including elimination of the Type-S program or developing a stock that either covers the entire return (i.e., combining the two types into one) or is based on the run timing of naturally produced coho salmon that return to the basin.

**19.2.4.2.4 Program Performance.** The stray rate has not been estimated for program fish. WDFW estimates that over 30 percent of the naturally spawning populations are hatchery-origin coho. The smolt-to-adult survival rate averaged 0.18 percent for the 1993 to 97 broodyears (APRE reports). Returns to the hatchery have improved, averaging over 4,317 from 1999 to 2003 (OPITT 2004). The continuation of this program is dependent on Mitchell Act funding. The barrier dam is in need of repair to make it impassable at high flows, thereby allowing for monitoring of coho passage and escapement into the upper Elochoman River. The intake structure for the Elochoman Hatchery also needs to be upgraded to meet NOAA Fisheries criteria.

**19.2.4.2.5 VSP Effects.** The net effects of the program are unknown but probably negative. Most natural produced coho salmon are probably second-generation hatchery coho. The program was developed using local and non-local coho stock but does represent the later return timing of the historical population. Segregation of early and late stocks of coho at the hatchery is also a concern.

### **19.2.4.3 Cathlamet High School FFA Type-N Coho Program**

**19.2.4.3.1 Broodstock History.** Type-N coho salmon for this program are transported from the Elochoman Hatchery.

**19.2.4.3.2 Similarity between Hatchery-origin and Natural-origin Fish.** This is a program to reestablish natural production into recently re-opened habitat. There are no natural spawning coho at this location.

**19.2.4.3.3 Program Design.** This a cooperative program between WDFW and the Future Farmers of America volunteers that provides for an isolated harvest of coho salmon and validates habitat improvements. Returning adults are allowed upstream to areas opened by a culvert removal. The FFA maintains an active monitoring program to identify the passage of adults. The production goal is a release of 20,000 smolts. Coho are transported in early March from the Elochoman Hatchery to an acclimation pond operated by the FFA on Bernie Creek. Coho smolts are released from mid-April to May.

**19.2.4.3.4 Program Performance.** This program was started in 1999 and monitoring results have not been reported. The continuation of this program is dependent on Mitchell Act funding.

**19.2.4.3.5 VSP Effects.** This small program may increase the spatial distribution of the reference population through the reintroduction of coho salmon into recently opened habitat. The use of Type-N coho may be more representative of what was present in the basin historically.

#### **19.2.4.4 Steamboat Slough Net Pens Type-S Coho Program**

**19.2.4.4.1 Broodstock History.** Coho salmon released from the Steamboat Slough net pens are from the Elochoman and Grays River hatcheries. These are early type coho that were derived from North Toutle Hatchery Type-S coho. North Toutle Hatchery coho have been used to fill shortfalls in production.

**19.2.4.4.2 Similarity between Hatchery-origin and Natural-origin Fish.** The coho program is designed to be isolated from the reference population. This program supports a terminal fishery targeting returning coho salmon.

**19.2.4.4.3 Program Design.** The purpose of this program is to support commercial and recreational terminal fisheries that will allow for greater harvest opportunities while minimizing impacts to listed salmon species. This program is part of the SAFE project. Coho at approximately 25 fish/lb are transferred from the Elochoman and Grays River hatcheries in mid-November to be reared over winter and released in late April to mid-May. Releases from the net pens are planned to occur after natural-origin chum salmon have emigrated from the area. The production goal is an annual release of 200,000 smolts. All production is adipose fin-clipped to allow for selective fisheries and to assess escapement and interactions with naturally produced coho salmon. Coho have been released in 1999-2002, and 2004.

**19.2.4.4.4 Program Performance.** Extensive spawning ground surveys are not conducted for coho salmon in Washington tributaries. Stray rates have not been estimated for this program. The smolt-to-adult survival rate for the 1997 broodyear was 2.4 percent (Brown *et al.* 2003). The harvest of coho in Steamboat Slough was 362 in 2000, 26 in 2001, 105 in 2002, and 107 in 2003 (WDFW and ODFW 2003). In the evaluation of the 1997 broodyear CWT recoveries of 575 fish, 209 were at the Elochoman Hatchery, five were at the Grays River Hatchery, and one was recovered at Fallert Creek on the Kalama River. Not included in those numbers are the program fish that spawned naturally, since spawning ground surveys are not conducted in local tributaries. This program is funded by BPA and is up for review in 2004.

**19.2.4.4.5 VSP Effects.** The net effect of the program is unknown. Program fish may not represent what was present historically. Hatchery fish that are not harvested can stray into local basins and spawn naturally, as indicated by the recoveries of program fish at the Elochoman and Grays River hatcheries.

#### **19.2.5 Upper Cowlitz River Coho Population**

##### **19.2.5.1 Cowlitz Type-N Coho Program**

**19.2.5.1.1 Broodstock History.** Hatchery-origin Type-N adults returning to the Cowlitz Salmon Hatchery and unmarked adults trapped at the barrier dam are used in this program. The

hatchery broodstock for this program was from coho salmon destined for above the Mayfield Dam, and is a combination all those populations above the dam, including both an early run-timed and a later run-timed coho. Coho releases from outside the basin have been limited and have had a minimal influence.

**19.2.5.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** The hatchery coho salmon were derived from the local population and are representative of the natural origin population. Current hatchery releases are not similar to natural-origin juveniles.

**19.2.5.1.3 Program Design.** The purpose of the program is to provide harvest and contribute to the reintroduction of the naturally spawning populations above the dams on the Cowlitz River. This program is funded as mitigation for hydro-system impacts and habitat losses in the Cowlitz River basin. Currently, surplus hatchery coho salmon are released above Cowlitz Falls Dam to support a selective fishery in the upper basin and to increase the number of naturally spawning adults to support reintroduction efforts. Up to half of the hatchery-origin adults are also released into the Tilton River to support reintroduction efforts in that basin. All unmarked adults that are collected at the Barrier Dam are hauled upstream above Cowlitz Falls Dam. Adults were used to speed natural production instead of releasing smolts and juveniles in the upper basin. Natural-origin adults are not used in the broodstock but have been in the past before program releases were 100-percent adipose fin-clipped. The current goal is to release 3,200,000 smolts annually on-station, a reduction from releases of 4,000,000 smolts prior to 2001. There is concern with predation of listed juvenile fall chinook by hatchery smolts. To address this issue, there are proposals to further reduce production and/or release a portion of the production below the fall chinook production areas. In addition, monitoring is needed to evaluate the natural production of coho salmon in the lower Cowlitz River.

**19.2.5.1.4 Program Performance.** An annual average of more than 4,500 natural-origin (unmarked) coho salmon have been released above Cowlitz Falls Dam between 2000 and 2003. The number of hatchery-origin adults and jacks released above Cowlitz Falls Dam was over 42,300 adults. The large number of hatchery-origin adults released above Cowlitz Falls Dam was to support an evaluation of assumptions regarding the carrying capacity of the upper basin as predicted through modeling. In addition, the release of adult coho also supported the semination of ocean derived nutrients. Coho salmon in the upper basin are being productive, juvenile coho smolt collections have increased from 4,000 to 6,000 in 1996 and 1997 to over 330,000 in 2001. Releases into the Tilton are also producing juveniles, with over 82,000 collected in 2001. These collection estimates are not adjusted for collection efficiency, which has been less than 50 percent for coho juveniles at the Cowlitz Falls Dam. Tacoma Public Utilities funds the operation of the program as mitigation for hydro-system operation in the Cowlitz River basin, and the program is expected to be funded for the life of the project license. The hatchery program size and implementation will be adjusted during negotiations on the development of the Fish Hatchery Management Plan for the Cowlitz River basin and will reflect natural production in the upper basin.

**19.2.5.1.5 VSP Effects.** The program has supported the reestablishment of naturally spawning coho salmon in the upper Cowlitz River and Tilton River basins. The program has increased the spatial distribution and is expected to increase diversity of the population. It is uncertain if the population will be self-sustaining if hatchery coho releases are discontinued due to poor

downstream survival through the hydro-system. If natural populations are established in the Tilton and upper Cowlitz River, then management of the hatchery program must address how natural populations and program coho salmon will be integrated.

## **19.2.6 Lower Cowlitz River Coho Population**

### **19.2.6.1 Cowlitz Type-N Coho Program**

**19.2.6.1.1 Broodstock History.** Hatchery-origin Type-N adults returning to the Cowlitz Salmon Hatchery and trapped at the barrier dam are used in this program. Coho salmon destined for areas above the Mayfield Dam provided the broodstock for this program, which is a combination of all those populations above the dam, including both an early run-timed and a later run-timed coho. Coho releases from outside the basin have been limited and have had minimal influence.

**19.2.6.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** The hatchery coho salmon were derived from the local population and are representative of the natural-origin population. Current hatchery releases are not similar to natural-origin juveniles in size and timing.

**19.2.6.1.3 Program Design.** The purpose of the program is to provide harvest, contribute to the conservation/recovery of the naturally spawning populations, and provide opportunities for educational and research activities. This program, which is funded as mitigation for hydro-system impacts and habitat losses in the Cowlitz River basin, is the archetype for Type-N coho and has therefore been used to supplement other Type-N coho programs in the lower Columbia River. Program fish are used to support the reintroduction efforts in the Cowlitz River basin above Mayfield Dam and in the use of remote site incubators to release juvenile coho in underutilized habitat (see programs below). Natural-origin adults are not used in the broodstock, but they were used in the past before program releases were 100-percent adipose fin-clipped. The current goal is to release 3,200,000 smolts annually on-station, a reduction from average annual releases of 4,000,000 smolts prior to 2001. There is concern with predation of listed juvenile fall chinook by hatchery smolts. To address this issue, there are proposals to reduce further production and/or release a portion of the production below the fall chinook production areas. In addition, monitoring is needed to evaluate the natural production of coho salmon in the lower Cowlitz River.

**19.2.6.1.4 Program Performance.** The stray rate of program coho salmon has not been estimated. Estimates of the natural production of coho salmon in the lower river have not been developed. The smolt-to-adult survival rate, based on CWT recoveries, was 1.25 percent and 2.8 percent for the 1997 and 1998 broodyears, respectively (APRE report). Smolt-to-adult survival rates have ranged from 4.59 percent for the 1988 broodyear to 0.17 percent for the 1991 broodyears (APRE report). Returns to the hatchery have averaged more than 57,750 annually from 1999 to 2003 (OPITT 2004). Tacoma Public Utilities funds the operation of the program as mitigation for hydro-system operation in the Cowlitz River basin, and the program is expected to be funded for the life of the project license. The hatchery program size and implementation will be adjusted during negotiations on the development of the Fish Hatchery Management Plan for the Cowlitz River basin and will reflect natural production in the upper basin.

**19.2.6.1.5 VSP Effects.** The program has maintained the Cowlitz Type-N coho population, which is a combination of coho salmon that historically returned to the Cowlitz River above Mayfield Dam. The program is being used to reestablish natural spawning populations in the upper Cowlitz and Tilton rivers. The program is currently not incorporating natural-origin coho in the broodstock, but will do so in the future. If natural populations are established in the Tilton and upper Cowlitz River, management of the program will have to address how populations and program coho salmon will be integrated. The large-scale hatchery releases may adversely affect listed fall chinook salmon in the lower Cowlitz River and needs to be evaluated.

#### **19.2.6.2 Cowlitz Game and Anglers Coho Program (Fry Releases)**

**19.2.6.2.1 Broodstock History.** Eyed eggs for this program are from the Cowlitz Salmon Hatchery.

**19.2.6.2.2 Similarity between Hatchery-origin and Natural-origin Fish.** Broodstock is representative of coho salmon in the Cowlitz River basin. Egg boxes will allow for adaptation to local conditions.

**19.2.6.2.3 Program Design.** The purpose of the program is to contribute to the conservation/recovery of the naturally spawning populations and to provide opportunities for educational and research activities. This program is funded as mitigation for hydro-system impacts and habit losses in the Cowlitz River basin. It is a cooperative program with a local fishing group that uses remote site incubators (RSIs). The goal is to increase the distribution of coho salmon into a number of lower Cowlitz River tributaries. The Cowlitz Salmon Hatchery provides 40,000 eyed eggs to the group for rearing and release. A Benefit Risk Assessment Protocol (BRAP) was completed on this program, and it was thought to be of low risk. Monitoring will need to be conducted to determine the effects of the program on the reference population.

**19.2.6.2.4 Program Performance.** The performance of the program is unknown but expected to have small if any effect on the reference population. Tacoma Public Utilities funds the operation of the program as mitigation for hydro-system operation in the Cowlitz River basin, and is expected to continue funding for the life of the project license. The hatchery program size and implementation will be adjusted during negotiations on the development of the Fish Hatchery Management Plan for the Cowlitz River basin and will reflect natural production in the upper basin.

**19.2.6.2.5 VSP Effects.** The effects of this program are unknown but are expected to be small based on the size of the program. The program may increase spatial distribution of the reference population by releasing fish in under utilized habitat.

#### **19.2.6.3 Friends of the Cowlitz Coho Program (Fry releases)**

**19.2.6.3.1 Broodstock History.** Eyed eggs for this program are from the Cowlitz Salmon Hatchery.

**19.2.6.3.2 Similarity between Hatchery-origin and Natural-origin Fish.** Broodstock is representative of coho salmon in Cowlitz River basin. Egg boxes will allow for adaptation to local conditions.

**19.2.6.3.3 Program Design.** The purpose of the program is to contribute to the conservation/recovery of the naturally spawning populations and for educational and research activities. This program is funded as mitigation for hydro-system impacts and habitat losses in the Cowlitz River basin. This is a cooperative program with a local fishing group that used RSIs. The goal is to increase the distribution of coho salmon into lower Cowlitz River tributaries. The Cowlitz Salmon hatchery provides 140,000 eyed eggs to the group for rearing and release. BRAP was completed on this program and it was thought to be of low risk. Monitoring will need to be conducted to determine effects of the program on the reference population.

**19.2.6.3.4 Program Performance.** The performance of the program is unknown but expected to have small if any effect on reference population. Tacoma Public Utilities funds the operation of the program as mitigation for hydro-system operation in the Cowlitz River basin, and is expected to be funded for the life of the project license. The hatchery program size and implementation will be adjusted during negotiations on the development of Fish Hatchery Management Plan for the Cowlitz River basin and will reflect natural production in the upper basin.

**19.2.6.3.5 VSP Effects.** The effects of this program are unknown but are expected to be small based on the type of the program. The program may increase spatial distribution of the reference population by releasing fish in under utilized habitat.

## **19.2.7. North Fork Toutle Coho Population**

### **19.2.7.1 North Toutle Type-S Coho Program**

**19.2.7.1.1 Broodstock History.** Broodstock for the program is collected at the North Toutle Hatchery on the Green River. The North Toutle coho stock has been managed to maintain stock integrity and the unique characteristics of this historical population. Efforts to maintain this stock include transferring production to the Grays River hatchery after the eruption of Mount St. Helens. The Toutle River coho were uniquely marked and kept separate from other coho stocks in the Grays River. When natural production returned to the Toutle River, the hatchery program was returned to the North Toutle Hatchery.

**19.2.7.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** This population has not actively incorporated naturally produced adults and may have diverged from the naturally spawned population.

**19.2.7.1.3 Program Design.** The goal of this program is to provide harvest of Type-S coho in the Toutle River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss. Adults are collected via a picket weir on the Green River at the North Toutle Hatchery. The weir allows some control over the escapement of Type-S coho into the Green River. The program production goal is for an annual release of 800,000 smolts. All of the production is adipose fin-clipped to allow for selective fisheries and identify hatchery-

origin adults returning to the basin. Smolts are reared and released on-station. An escapement goal has not been established for the Green River and is in development. More monitoring and evaluation funds are needed to evaluate natural production in the Toutle River basin. This program is the archetype for Type-S coho salmon and has been used to supplement other Type-S coho programs.

**19.2.7.1.4 Program Performance.** Stray rates for program coho salmon have not been estimated. The smolt-to-adult survival rate of program coho salmon averaged 2.0 percent for the 1993 to 1997 broodyears (Miller *et al.* 2003). Returns to the hatchery have averaged over 21,575 annually from 1999 to 2003 (OPITT 2004). Program coho salmon may not be representative of other coho populations in the Toutle River but reflect production in the Green River. Historically, the Toutle River basin supported both early- and late-returning coho salmon. The continuation of this program is dependent on Mitchell Act funding. Facilities improvements are needed to better handle returning coho salmon.

**19.2.7.1.5 VSP Effects.** The program has maintained the Toutle Type-S coho population and can be used to supplement the reference population. The program is currently not incorporating natural-origin coho in the broodstock.

## **19.2.8 Kalama River Coho Population**

### **19.2.8.1 Kalama Type-N Coho Program**

**19.2.8.1.1 Broodstock History.** Broodstock for this program are collected from adults returning to the Kalama Falls Fishway trap. This program has used coho from other hatcheries in the past with Elochoman Hatchery Type-N coho being released in 2001.

**19.2.8.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** Natural production of coho is limited to the habitat below Kalama Falls Hatchery. No hatchery-origin coho are passed above Kalama Falls. The program is designed to be isolated from any natural spawning population.

**19.2.8.1.3 Program Design.** The goal of this program is to provide harvest of Type-N coho in the Kalama River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss. This is managed as an isolated program, and unmarked coho salmon are not incorporated into the broodstock. There is limited habitat in the basin, and no hatchery coho are passed above the Kalama Falls Fishway trap, though natural-origin adults are passed. The production goal for this program is an annual release of 350,000 smolts. All production is adipose fin-clipped to allow for selective fisheries and identification at the trap. Program coho are reared and released at Kalama Falls Hatchery. Natural production of coho below Kalama Falls is not monitored.

**19.2.8.1.4 Program Performance.** The stray rates for program coho salmon have not been estimated. Natural production estimates are not available. The smolt-to-adult survival rate has averaged 0.61 percent and ranged from 1.44 percent to 0.07 percent for the 1993 to 1997 broodyears (APRE report). Returns to the hatchery have averaged over 7,000 annually from 1999 to 2003 (OPITT 2004). This program is funded through the Mitchell Act, and future funding

is uncertain, though the research that is being conducted at this facility is considered very important to the evaluation of the production of hatchery-origin spawners. The dam at Kalama Falls was damaged by high flows in 2003 and is not a complete barrier to upstream passage. The breach has impacted the ability to sort and control the proportions of hatchery-origin and natural-origin coho salmon above the falls. The fishway trap is also in need of upgrading to improve handling and sorting of steelhead, chinook, and coho.

**19.2.8.1.5 VSP Effects.** The net effects of this program are unknown. The program fish may not represent what was historically present in the basin, and both types are being released. It is unknown if program coho salmon are successfully spawning below the falls. There is also concern with predation and interactions with other listed populations in the basin, particularly tule fall chinook.

#### **19.2.8.2 Kalama Type-S Coho Program**

**19.2.8.2.1 Broodstock History.** Broodstock is from adults collected at the Modrow trap (RK 4.8). This program has used coho from other hatcheries in the past, primarily from the North Toutle Hatchery (most recently in 1992).

**19.2.8.2.2 Similarity between Hatchery-origin and Natural-origin Fish.** Natural production of coho is limited to the habitat below Kalama Falls Hatchery. No hatchery-origin coho are passed above Kalama Falls. The program is designed to be isolated from any natural spawning population.

**19.2.8.2.3 Program Design.** The goal of this program is to provide harvest of Type-S coho in the Kalama River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss. This is managed as an isolated program, and unmarked coho salmon are not incorporated into the broodstock. There is limited habitat in the basin, and no hatchery coho are passed above the Kalama Falls Fishway trap, though natural-origin adults are passed. The production goal for this program is an annual release of 350,000 smolts. All production is adipose fin-clipped to allow for selective fisheries and identification at the trap. Program coho are reared and released at Fallert Creek Hatchery.

**19.2.8.2.4 Program Performance.** The stray rate of program coho salmon has not been estimated. Natural production estimates are not available. The smolt-to-adult survival rate has averaged 0.63 percent and ranged from 1.16 percent to 0.28 percent for the 1993 to 1997 broodyears (APRE report). Returns to the hatchery have averaged over 7,500 annually from 1999 to 2003(OPITT 2004). This program is funded through the Mitchell Act, and future funding is uncertain, though the research that is being conducted at this facility is considered very important to the evaluation of the production of hatchery-origin spawners. The dam at Kalama Falls was damaged by high flows in 2003 and is not a complete barrier to upstream passage. The breach has impacted the ability to sort and control the proportions of hatchery-origin and natural-origin coho salmon above the falls. The fishway trap is also in need of upgrading to improve handling and sorting of steelhead, chinook and coho.

**19.2.8.2.5 VSP Effects.** The net effects of this program are unknown. The program fish may not represent what was historically present in the basin, and both types are being released. It is



unknown if program coho salmon are successfully spawning below the falls. There is also concern with predation and interactions with other listed populations in the basin, particularly tule fall chinook.

## **19.2.9 North Fork Lewis Coho Population**

### **19.2.9.1 Lewis Type-N Coho Program**

**19.2.9.1.1 Broodstock History.** Broodstock for this program is collected at the Lewis River Trap and the Merwin Trap (Rkm 20.9 and Rkm 25.8, respectively). Type-N coho from other basins have been released in the past, with the most recent release of Cowlitz Type-N coho in 2001.

**19.2.9.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** There was probably both early and late-return coho salmon in the North Fork Lewis prior to the construction of Merwin Dam. The dam eliminated access to much of the spawning and rearing habitat for coho salmon. Currently, Cedar Creek has the majority of the remaining habitat in the lower river. The program coho may not represent natural-origin fish in the North Fork Lewis.

**19.2.9.1.3 Program Design.** The goal of this program is to provide harvest of Type-N coho in the North Fork Lewis River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss in the Lewis River basin. This program has provided eggs to many hatchery programs to backfill program shortages. The program production goal is an annual release of 815,000 smolts. Program fish are reared and released at the Lewis River Hatchery. All production is 100-percent adipose fin-clipped to allow for selective fisheries. A key issue with this program is which stock will be used for reintroduction into the upper Lewis River basin. Historically, the upper basin supported early returning coho and the lower basin later returning coho. An alternative to the use of program fish is use of coho returning to Cedar Creek. The natural-origin coho in Cedar Creek are productive, with over 20,000 juveniles outmigrating annually. Another concern is the potential for predation of fall chinook juveniles by program coho. Alternatives have been suggested, including reducing production, acclimating program fish below the fall chinook production areas, and using flushing flows during periods of coho release. Monitoring of the fall chinook population and interactions with program coho are needed.

**19.2.9.1.4 Program Performance.** Stray rates for this program have not been estimated. Naturally produced coho in the mainstem Lewis River are not monitored, but any natural production is expected to be substantially influenced by hatchery-origin adults. The smolt-to-adult survival rate has averaged 2.29 percent for the broodyears 1994 to 1998 (APRE report). The smolt-to-adult return rate reached 5.77 percent for the 1998 broodyear (APRE report). Returns to the hatchery have averaged almost 17,250 annually from 1999 to 2003 (OPITT 2004). The program is funded by PacifiCorp as mitigation for the construction and operation of the Lewis River dams. It is expected that the program and the hatchery facilities will be modified as part of the relicensing process.

**19.2.9.1.5 VSP Effects.** The net effects of the program are unknown. Most naturally produced fish are probably second-generation program coho. The program was developed using locally

adapted broodstock, though separation of Type-N and Type-S coho is still a concern. The program may provide benefit in the future if used for reintroduction.

#### **19.2.9.2 Lewis Type-S Coho Program**

**19.2.9.2.1 Broodstock History.** Broodstock for this program is collected at the Lewis River Trap and the Merwin Trap (Rkm 20.9 and Rkm 25.8, respectively). Type-S coho from other basins were released in the past, with the last release from the North Toutle Hatchery in 1992. Since that time, production has been from returning program adults.

**19.2.9.2.2 Similarity between Hatchery-origin and Natural-origin Fish.** There were probably both early- and late-return coho salmon in the North Fork Lewis prior to the construction of Merwin Dam. The dam eliminated access to much of the spawning and rearing habitat for coho salmon. Currently, Cedar Creek has the majority of the remaining habitat in the lower river. The program coho may not represent natural-origin fish in the North Fork Lewis.

**19.2.9.2.3 Program Design.** The goal of this program is to provide harvest of Type-S coho in the North Fork Lewis River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss in the Lewis River basin. This program has provided eggs to many hatchery programs to backfill program shortages. The program production goal is an annual release of 880,000 smolts. Program fish are reared and released at the Lewis River Hatchery. All production is 100-percent adipose fin-clipped to allow for selective fisheries. A key issue with this program is which stock will be used for reintroduction into the upper Lewis River basin. Historically, the upper basin supported early returning coho and the lower basin later returning coho. An alternative to the use of program fish, is use coho returning to Cedar Creek. The natural-origin coho in Cedar Creek are productive, with over 20,000 juveniles outmigrating annually. Another concern is the potential for predation of fall chinook juveniles by program coho. Alternatives have been suggested, including reducing production, acclimating program fish below the fall chinook production areas, and using flushing flows during periods of coho release. Monitoring of the fall chinook population and interactions with program coho are needed.

**19.2.9.2.4 Program Performance.** Stray rates for this program have not been estimated. Naturally produced coho in the mainstem Lewis River are not monitored, but any natural production is expected to be substantially influenced by hatchery-origin adults. The smolt-to-adult survival rate has averaged 2.43 percent for the broodyears 1994 to 1998 (APRE report). The smolt-to-adult return rate reached 6.11 percent for the 1998 broodyear (APRE report). Returns to the hatchery have averaged almost 25,750 annually from 1999-2003 (OPITT 2004). The program is funded by Pacificorp as mitigation for the construction and operation of the Lewis River dams. It is expected that the program and the hatchery facilities will be modified as part of the relicensing process.

**19.2.9.2.5 VSP Effects.** The net effects of the program are unknown. Most naturally produced fish are probably second-generation program coho. The program was developed using locally adapted broodstock, though separation of Type-N and Type-S coho is still a concern. The program may provide benefit in the future if used for reintroduction.

### **19.2.9.3 Fish First Wild Coho Program (Smolt Releases and RSIs in Cedar Creek Basin)**

**19.2.9.3.1 Broodstock History.** Broodstock is collected from unmarked coho trapped at the Cedar Creek gristmill.

**19.2.9.3.2 Similarity between Hatchery-origin and Natural-origin Fish.** This is a new program and has used only unmarked coho returning to Cedar Creek. Adult coho salmon from the Lewis River program are also released into this basin, but it is unknown if they are reproducing successfully.

**19.2.9.3.3 Program Design.** The program is designed as a cooperative effort to increase natural production in Cedar Creek. EDT analysis was conducted, and it was determined that one of the limiting factors was a lack of stream incubation capacity. To address this, the program uses RSIs in numerous tributaries to Cedar Creek. Adults are collected at the Cedar Creek gristmill trap and held and spawned at Speelyai Hatchery. The eggs are taken to Washougal Hatchery for otolith marking and then returned to the RSIs. The smolt program rears the coho at Speelyai and then acclimates the smolts at the Cedar Creek pond. The production goal for the smolt program is 15,000 smolts. The smolts are marked with elastomer and blank wire tags. The production goal for the RSI portion of the program is a release of 400,000 fry. In addition to the smolt outplants and RSIs, an additional 100 pair of coho adults from the Lewis River Hatchery are outplanted into Cedar Creek. Coho carcasses are also outplanted near the RSI sites. A chiller at a local facility would reduce the need to transport eggs to Washougal Hatchery. Monitoring and evaluation activities need funding to improve the screw trap at the gristmill, monitor carcasses on the spawning grounds, and analyze otolith marks.

**19.2.9.3.4 Program Performance.** This is a relatively new program, and as a result, stray rates and return rates for program releases have not been estimated. The basin is producing smolts, with over 20,000 collected at the screw trap annually. The program was designed as a “jump start” and is not expected to continue into the future, but any facilities improvements could be used to monitor the population. The program is funded by Pacificorp as mitigation for the construction and operation of the Lewis River dams. It is expected that the program and the hatchery facilities will be modified as part of the dam relicensing process.

**19.2.9.3.5 VSP Effects.** The program may benefit the reference population by increasing the number of spawners and spatial distribution. The program uses broodstock from Cedar Creek and addresses the limiting factor of incubation capacity. The program is using RSIs, and these are not expected to have a negative effect. The program releases are in under-utilized habitat.

### **19.2.9.4 Fish First Type-N Coho Program (Smolt Releases and RSIs in N.F. Tributaries) (Note this program was terminated after 2004 releases.)**

**19.2.9.4.1 Broodstock History.** Eyed eggs used in this program are from the Lewis River Hatchery Type-N coho.

**19.2.9.4.2 Similarity between Hatchery-origin and Natural-origin Fish.** The program may not represent what was in the lower river historically, but the program fish are the most representative of coho salmon that are currently present.

**19.2.9.4.3 Program Design.** The program is designed to “jump start” natural production in the tributaries to the lower North Fork Lewis River. Eyed eggs are reared at the Lewis River Hatchery and outplanted to RSI in areas that are associated with habitat improvements by Fish First, a conservation organization. The program is currently producing 460,000 fry from RSIs at ten different locations. This may be the appropriate stock for this program, because late returning coho were probably present historically in the lower Lewis River, whereas early returning coho spawned in the upper basin. This distribution has been observed for early and late coho in the Clackamas River basin.

**19.2.9.4.4 Program Performance.** This is a relatively new program, and monitoring is limited. EDT analysis was completed in the basin, and it was determined that RSIs would address limiting factors. The program is funded by Pacificorp as mitigation for the construction and operation of the Lewis River dams. It is expected that the program and the hatchery facilities will be modified as part of the relicensing process.

**19.2.9.4.5 VSP Effects.** The effects of this program are unknown but expected to be of little risk. The program may increase the spatial distribution of the reference population. The program is using RSIs to get adult coho to return to under-utilized habitat.

## **19.2.10 Clackamas River Coho Population**

### **19.2.10.1 Eagle Creek NFH Coho Program**

**19.2.10.1.1 Broodstock History.** Returns to the hatchery are used for broodstock. In the past, if production goals were not achieved, coho from the Sandy, Big Creek, Bonneville, North Toutle, or Willard hatcheries were used to fill the shortfall. The stock originated from Sandy River, North Toutle and Big Creek stocks and coho returning to Eagle Creek. The program collects adults from September through November. Late-returning coho do not enter Eagle Creek until December, after egg-take activities have ended.

**19.2.10.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** The program does not incorporate any natural-origin coho into the broodstock. This is an isolated program that is still part of the ESU.

**19.2.10.1.3 Program Design.** The goal of this program is to provide harvest of coho in the Eagle Creek, Clackamas River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss. The program has also provided juvenile coho for programs in Idaho and the SAFE project net pens. The SAFE project portion of the program has been eliminated due to funding cuts. The Eagle Creek production will be used to backfill programmed releases in the upper Columbia River and the Yakima River basin. The program production goal is for an annual release of 500,000 smolts on-station. All the production is adipose fin-clipped to allow for selective fisheries. There are proposals for additional monitoring of coho in Eagle Creek to determine the source of natural production in North Fork Eagle Creek.

**19.2.10.1.4 Program Performance.** The stray rate of program coho has not been estimated. The smolt-to-adult survival rate averaged 0.93 percent for the 1993 to 1996 broodyears (Eagle Creek NFH coho HGMP). Returns to the hatchery have averaged almost 17,250 adults from 1999 to 2003. This program is isolated from later returning natural-origin coho that are present in the Clackamas River. A 2002 spawning ground survey showed that there were 2,402 coho spawning below the North Fork Dam and that 78 percent of these were of hatchery origin. However, 88 percent of the coho spawning above the North Fork Dam were of natural origin, and 100 percent of the coho sampled in Clear Creek (a lower Clackamas River tributary) were of natural origin (Brown et al. 2003). This may indicate that Eagle Creek NFH coho do not stray to all parts of the Clackamas River basin. The hatchery-origin fish in the lower river are from releases of Clackamas Hatchery and Eagle Creek NFH coho. The Clackamas River program was terminated in 2001. There are very few natural-origin coho handled during broodstock collection activities from December to March. The Eagle Creek Hatchery is located below a natural falls, and there is no coho habitat above the hatchery. Natural-origin coho juveniles have been collected from North Fork Eagle Creek, but it is uncertain if these were from hatchery-origin or natural-origin adults. This program is funded through the Mitchell Act, and future funding of this program is uncertain.

**19.2.10.1.5 VSP Effects.** The net effects of this program are unknown but are expected to be small, since the hatchery population has an earlier spawn timing and is spatially separated from the later spawning coho population. This population may be representative of the early time spawning population in the lower Clackamas River.

## **19.2.11 Salmon Creek Coho Population**

**19.2.11.1 Clark PUD Type - N Coho Program (fry release, Washougal eggs); Dist. 5 Firefighters Type - N Coho Program (fry release, Washougal eggs); Syverson Project Type - N Coho Program (fry release, Lewis eggs)**

**19.2.11.1.1 Broodstock History.** Eyed eggs for these programs are from the Washougal Hatchery.

**19.2.11.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** These program coho are from another population. It is unknown if natural-origin coho salmon are present in Salmon Creek or are returns from program releases.

**19.2.11.1.3 Program Design.** The program is designed to “jump start” natural production in the Salmon River and to support educational and habitat restoration efforts. Eyed eggs are transferred from the Washougal Hatchery and released through RSIs into the Salmon River basin. The Clark PUD program release goal is 70,000 fry and the District 5 Firefighters program goal is 90,000 fry. The smaller Syverson Project releases 5,000 fry that originate from the Lewis River Hatchery Type-N Coho program. There is some question about whether these are appropriate stocks to use in the basin. The status of the natural production is unknown. Monitoring and broodstock collection could be achieved if a trap were constructed as part of the needed improvements to the barrier at the Highway 99 bridge. It has also been proposed to otolith program coho so they could be identified during carcass surveys.

**19.2.11.1.4 Program Performance.** Stray rates and natural production estimates for coho salmon in Salmon Creek are unknown. It is also unknown if program fish are producing returning adults.

**19.2.11.1.5 VSP Effects.** The net effect of these RSI programs is unknown but may be adverse, since the programs use out-of-basin coho. The status and origin of the natural population must be determined to evaluate whether these programs are reestablishing or adversely affecting the reference population.

## **19.2.12 Sandy River Coho Population**

### **19.2.12.1 Sandy Coho Program**

**19.2.12.1.1 Broodstock History.** Broodstock is collected from adults returning to the hatchery. Broodstock for the program has been almost entirely from the Sandy River basin, with small releases from Bonneville Hatchery.

**19.2.12.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** This program is currently isolated from the naturally spawning population above Marmot Dam. The program does not include unmarked adults in the broodstock.

**19.2.12.1.3 Program Design.** The goal of this program is to provide harvest of coho in the Sandy River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss in the Columbia River and Sandy River basins. The production goal for the program is an annual release of 700,000 coho on-station and to provide 300,000 coho to the SAFE project net pens. All coho production is adipose fin-clipped to allow for selective fisheries and identification at the Marmot Dam trap. Production may change after Marmot Dam is removed, if the proportion of hatchery coho migrating upstream exceeds program goals. The hatchery weir and intake structures currently block access to Cedar Creek above the hatchery. ODFW has obtained funds to design a new intake structure and adult weir that will allow passage. The incorporation of natural-origin coho into the broodstock is being evaluated.

**19.2.12.1.4 Program Performance.** The stray rates for program coho have not been estimated. The estimated number of coho returning to the Sandy River in 2002 was 581 adults, of which 318 (54.7 percent) were natural-origin. The majority of the natural-origin coho (310) were passed above Marmot Dam, where no hatchery-origin fish are allowed upstream. Smolt-to-adult survival rates averaged 0.46 percent for the 1994 to 1998 broodyears (APRE reports). Returns to the hatchery averaged over 9,900 annually from 1999 to 2003(OPITT 2004). This program is funded through the Mitchell Act, and future funding is uncertain. Funding for the personnel at Marmot Dam trap is provided by Portland General Electric. Marmot Dam is scheduled for removal in 2007.

**19.2.12.1.5 VSP Effects.** The net effects of this program are unknown, but the program has not adversely affected the reference population. In the 2003-04 return-year, only five hatchery-origin coho salmon were intercepted at Marmot Dam out of a return of 1,178 adults. This program is representative of the reference population, but there is concern that it will diverge without input

of natural-origin adults. If the program diverges, then natural spawning of program fish in the lower river may adversely affect the genetic diversity of the reference population.

### **19.2.13 Washougal River Coho Population**

#### **19.2.13.1 Washougal Hatchery Type-N Program**

**19.2.13.1.1 Broodstock History.** Broodstock for the program is from returns to the Washougal Hatchery. Other hatchery programs in the lower Columbia River have been used to supplement this program. The Lewis River Hatchery Type-N coho have been released as recently as 1999. Early Type-S coho from Big Creek, Lewis River, and North Toutle hatcheries were also released in 1998 and 2000.

**19.2.13.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** The hatchery program coho are similar to what is present in the basin and represents the later return timing of the historical population.

**19.2.13.1.3 Program Design.** The goal of this program is to provide harvest of coho in the Washougal River, lower Columbia River/Estuary, and the Pacific Ocean as mitigation for hydro-system development and habitat loss. All production occurs at the Washougal Hatchery. The program production goal is for an annual release of 500,000 coho smolts on-station. The Washougal Hatchery also supports coho programs in the Klickitat River basin, releasing up to 2.5 million coho annually. It has been proposed that natural origin coho be collected and incorporated into the broodstock, but they may have to be collected in other parts of the basin. There have been proposals to release some of the program fish in lower river tributaries that historically supported coho salmon. Another proposal was to construct a trap at Salmon Falls and use it for collecting broodstock, though this would be a major investment.

**19.2.13.1.4 Program Performance.** The stray rates for the program coho have not been estimated. The status of the naturally spawning population in the Washougal River is unknown, as is the proportion of hatchery-origin adults spawning naturally. The smolt-to-adult survival rate averaged 3.63 percent for the 1996 to 1998 broodyears (APRE report). This is an improvement over survival rates that were less than 0.25 percent in previous broodyears. Returns to the hatchery have averaged over 10,200 from 1999 to 2003(OPITT 2004). This program is funded through the Mitchell Act, and future funding is uncertain.

**19.2.13.1.5 VSP Effects.** The net effect of this program on the reference population is unknown. The program currently is not integrated with the natural population, and it is unknown what the proportion of hatchery-origin fish is in the naturally spawning population. The large returns to the hatchery suggest that a majority of the naturally spawning population is hatchery-origin. The use of out-of-basin stocks may have adversely affected diversity of the program coho and the reference population.

### **19.2.14 Lower Gorge Tributaries Coho Population**

#### **19.2.14.1 Bonneville/Cascade/Oxbow Coho Program**

**19.2.14.1.1 Broodstock History.** Broodstock for the program is collected at the Bonneville Hatchery. Broodstock has primarily been from returns to the hatchery, but Eagle Creek NFH coho salmon have also been released at the hatchery.

**19.2.14.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** There is very limited spawning habitat, and it is unknown if the program coho salmon are similar to the reference population.

**19.2.14.1.3 Program Design.** The goal of this program is to provide harvest of coho in the lower Columbia River/Estuary and the Pacific Ocean as mitigation for hydro-system development and habitat loss. Broodstock is collected at Bonneville Dam and eggs are transferred to Cascade and Oxbow Hatcheries for rearing. The Bonneville Hatchery program supports releases to the SAFE project net pens and coho releases in the Umatilla River basin. The current on-station release is 1,175,000 smolts. All production from this program is adipose fin-clipped to allow for selective fisheries.

**19.2.14.1.4 Program Performance.** The stray rates for this program have not been estimated. The status of the natural spawning population is unknown, but the estimate for the lower Gorge and upper Gorge coho populations in Oregon was 1,317 in 2002 (Brown *et al.* 2003). Of that total, only 159 (12.1 percent) were estimated to be of natural origin. These estimates are complicated by releases of unmarked coho in areas above Bonneville Dam. The estimated smolt-to-adult survival rate averaged 1.10 percent for the 1994 to 1998 broodyears (APRE report). Returns to the hatchery complex (Bonneville, Cascade, Oxbow) averaged almost 26,000 annually from 1999 to 2003 (OPITT 2004). The program is 55-percent funded through the Mitchell Act and 45-percent by the Army Corps of Engineers, which funds 45 percent of all the production at Bonneville Hatchery. BPA funds the marking of the coho releases and some of the rearing associated with the coho production going to the SAFE net pens. Continued funding from the Mitchell Act is uncertain at the present, and the portion of the program it supports is managed on a year-to-year basis.

**19.2.14.1.5 VSP Effects.** The net effects of this program are unknown. Most of the naturally produced coho in the area tributaries are probably second-generation hatchery coho, though the actual source has not been determined.

## **19.2.15 Upper Gorge Tributaries Coho Population**

### **19.2.15.1 Little White Salmon/Willard NFH Coho Program**

**19.2.15.1.1 Broodstock History.** Broodstock for the program is from adults returning to the facility on the Little White Salmon River. Coho production was attempted from 1930 to 1950 with coho from outside the ESU and with Toutle River stock coho. It was the Toutle River stock that established this program in 1956. This is an early run program that has received eggs and/or fish for rearing from Fallert Creek, Bonneville, Speelyai, and Eagle Creek hatcheries.

**19.2.15.1.2 Similarity between Hatchery-origin and Natural-origin Fish.** This is an isolated program. There is no remaining natural spawning habitat in the Little White Salmon.



**19.2.15.1.3 Program Design.** The goal of this program is to provide harvest of coho in the lower Columbia River/Estuary and the Pacific Ocean as mitigation for hydro-system development and habitat loss. This program rears coho salmon for release on-station (1,000,000) and for reintroduction programs in the Yakima River basin (500,000) and the upper Columbia River (500,000). Broodstock collected in the Yakima River and Wenatchee River are spawned and reared at Willard NFH and then transferred back to the basin of origin for release. The on-station releases of coho salmon have been eliminated due to funding cuts.

**19.2.15.1.4 Program Performance.** The stray rates for this program have not been estimated. The status of the naturally spawning population is unknown, but the estimate for the lower Gorge and upper Gorge coho populations in Oregon was 1,317 in 2002 (Brown *et al.* 2003). Of that total, only 159 (12.1 percent) were estimated to be of natural origin. These estimates are complicated by releases of unmarked coho in areas above Bonneville Dam. The smolt-to-adult survival rate averaged 0.13 percent for the 1990 to 1994 broodyears and ranged from 0.10 to 0.24 percent (LWS NFH Coho HGMP). The returns to the hatchery averaged 2.236 annually from 1997 to 2001. This program is funded through the Mitchell Act, and future funding is uncertain, but if funding is found, the program will be reestablished..

**19.2.15.1.5 VSP Effects.** This program is scheduled for termination with the final on-station release in 2004, though other programs are expected to continue at the hatchery as they are supported by alternate funding sources. Impacts from the program releases should decline after 2006. It is unknown what proportion of the naturally spawning population are fish from this program.

**Table 19.1.** Artificial propagation programs affecting Lower Columbia River coho populations.

<b>Ecological zone</b>	<b>Historical population</b>	<b>Artificial propagation programs Integrated with historical population</b>	<b>Artificial propagation programs releasing ESU coho not integrated with historical population (segregated)</b>	<b>Included in the ESU?</b>	<b>Program release (smolt unless otherwise noted)</b>	<b>Year initiated</b>
Coastal	Youngs Bay		CEDC Coho Salmon Program - Youngs Bay	No	1700000	1993
			Astoria High School (STEP) Coho Fry Program. (Big Creek Hatchery Coho)	Yes	5,000	
			Warrenton High School (STEP) Coho Fry Program. (Big Creek Hatchery Coho)	Yes	7,500	
	Grays River	Grays River Type-S Coho Program		Yes	150,000	1961
		Sea Resources Type-S Coho Program		Yes	52,500	1996
		Peterson Coho Project Fry Program (Sea Resources stock)		Yes	5,000	1999
		Deep River Net Pens Type-S Coho Program		Yes	350,000	1993
	Big Creek	Big Creek Hatchery Coho Program		Yes	535000	1941
			CEDC Coho Salmon Program - Tongue Point/Blind Slough	Yes	500,000	1993
	Elochoman River	Elochoman Type - S Coho Program		Yes	418,000	1954
		Elochoman Type - N Coho Program		Yes	497,000	1954
		Cathlamett High School FFA Type-N Coho Program		Yes	15,000	1999
			Steamboat Slough Net Pen Type -S Coho Program	Yes	200,000	1999
	Clatskanie River					
	Mill, Germany, Abernathy					
	Scappoose Creek					

<b>Ecological zone</b>	<b>Historical population</b>	<b>Artificial propagation programs Integrated with historical population</b>	<b>Artificial propagation programs releasing ESU coho not integrated with historical population (segregated)</b>	<b>Included in the ESU?</b>	<b>Program release (smolt unless otherwise noted)</b>	<b>Year initiated</b>
Cascade	Upper Cowlitz River	Cowlitz Type - N Coho Program		Yes		1996
	Lower Cowlitz River	Cowlitz Type - N Coho Program		Yes	3200000	1967
		Cowlitz Game and Anglers Coho Program (fry releases in various locations)		Yes	40,000	
		Friends of the Cowlitz Coho Program (fry releases various locations)		Yes	140,000	
	North Fork Toutle River	North Toutle Type - S Coho Program		Yes	800,000	1951
	South Fork Toutle River					
	Coweeman River					
	Kalama River		Kalama River Type-N Coho Program	No	350,000	
			Kalama River Type-S Coho Program	No	350,000	
	North Fork Lewis River	Lewis River Type - S Coho Program		Yes	880,000	
		Lewis River Type - N Coho Program		Yes	815,000	
		Fish First Wild Coho Program (smolt releases and RSIs in Cedar Creek basin)		Yes	15,000	
				Yes	400000	
		Fish First Type - N Coho Program (fry releases with RSIs in North Fork basin)		Yes	460000	

<b>Ecological zone</b>	<b>Historical population</b>	<b>Artificial propagation programs Integrated with historical population</b>	<b>Artificial propagation programs releasing ESU coho not integrated with historical population (segregated)</b>	<b>Included in the ESU?</b>	<b>Program release (smolt unless otherwise noted)</b>	<b>Year initiated</b>
	East Fork Lewis River					
	Clackamas River	Eagle Creek NFH Coho Program		Yes	500000	1957
	Salmon Creek		Clark PUD Type - N Coho Program (fry release, Washougal eggs)	Yes	70000	
			Dist. 5 Firefighters Type - N Coho Program (fry release, Washougal eggs)	Yes	90000	
			Syverson Project Type - N Coho Program (fry release, Lewis eggs)	Yes	5,000	
	Sandy River	Sandy River Coho Program		Yes	1,000,000	
	Washougal River		Washougal Type - N Coho Program	Yes	500,000	1985
Gorge	Lower Gorge Tributaries	Bonneville/Cascade/ Oxbow Coho Program		Yes	350,000	
	Upper Gorge Tributaries		Little White Salmon/ Willard NFH Coho Program	Yes	634,000	
	Big White Salmon River					
	Hood River					

**Table 19.2.** Abundance of coho salmon in the Lower Columbia ESU.

	Youngs Bay	Youngs Bay	Big Creek	Grays River	Elochoman	Clatskanie			Mill, Germany, Abernathy		Scappoose

**Table 2 (continued).** Abundance of coho salmon in the Lower Columbia ESU.

Upper Cowlitz, Cispus														Kalama	North Fork Lewis	Clackamas	Sandy	Washougal
Return Year	Tilton	Unmarked adult released	Hatchery adult releases	Lower Cowlitz	North Fork Toutle	South Fork Toutle	Cowe eman	Kalama Hatcheries	North Fork Lewis Hatchery Complex	East Fork Lewis	Eagle Creek NFH	Sandy Hatchery	Washougal Hatchery					
1985				19,145	0			2,114	10,770		4,461	8,145	7,232					
1986				55,641	0			12,577	50,915		13,394	25,872	27,442					
1987				18,908	0			1,669	12,424		3,211	5,467	3,747					
1988				31,441	0			7,942	32,393		2,892	10,297	3,580					
1989				36,455	0			5,092	48,355		9,915	22,199	5,567					
1990				14,362	2,745			8,371	24,699		1,314	6,131	2,042					
1991				47,536	13,374			7,318	92,718		5,724	11,534	9,316					
1992				16,613	1,291			1,014	21,692		3,622	13,911	6,252					
1993				5,968	7,075			1,585	10,432		575	231	616					
1994				7,235	6,106			2,092	12,429		2,795	7,947	1,241					
1995				8,358	2,137			2,016	2,440		2,820	3,264	515					
1996				9,367	15,023			1,288	10,012		1,514	328	1,085					
1997			1,526	15,694	8,399			1,346	18,514		1,246	1,286	2,111					
1998			4,036	18,378	6,506			4,556	23,012		12,612	5,476	3,656					
1999			8,268	40,321	12,508			7,816	35,183		11,779	1,013	3,120					
2000		4,781	22,229	50,395	28,774			14,399	40,236		33,106	12,506	5,817					
2001		1,292	31,327	75,744	15,730			31,202	99,468		30,146	20,454	21,586					
2002		2,794	37,068	82,876	18,828			9,125	23,486		6,285	6,979	19,309					
2003		8,349	54,188	39,445	32,052			9,341	62,631		4,808	8,746	5,181					

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Return Year	Bonneville Hatchery	White Salmon	Upper Gorge Tributaries	Hood River
1985	23,702			
1986	53,669			
1987	11,417			
1988	11,024			
1989	40,148			
1990	12,281			
1991	24,686			
1992	13,552			
1993	8,764			
1994	27,410			
1995	4,850			
1996	14,883			
1997	15,065			
1998	6,076			
1999	4,512			
2000	18,116			
2001	45,163			
2002	25,888			
2003	36,318			

**Table 2 (continued).** Abundance of coho salmon in the Lower Columbia ESU.

## 19.3 CONCLUSIONS

**Existing Status:** Candidate  
**BRT Finding:** Endangered  
**Recommendation:** Threatened

### 19.3.1 ESU Overview

#### 19.3.1.1 History of Populations

The WLC TRT tentatively identified 23 historic populations within the LCR coho salmon ESU (Myers et al. 2002). The Upper Cowlitz, North Fork Lewis and Big White Salmon Populations were extirpated due to dam construction. The Upper Cowlitz River population has been a target of re-introduction efforts. The BRT (2003) concluded that most the populations, other than the extant Clackamas River and Sandy River populations, have very little, if any, natural production. This may not be an accurate conclusion, because in many tributaries surveys have not been conducted. Evidence for natural production includes the collection of juvenile outmigrants in basins without hatchery programs.

The other historical populations in the ESU are: Youngs Bay, Grays River, Big Creek, Elochoman River, Clatskanie River, Mill-Abernathy-Germany, Scappoose Creek, Lower Cowlitz River, Coweeman River, North Fork Toutle River, South Fork Toutle River, Kalama River, East Fork Lewis River, Salmon Creek, Washougal River, Lower Gorge Tributaries, Upper Gorge Tributaries, Hood River, and Big White Salmon River.

#### 19.3.1.2 Association Between Natural Populations and Artificial Propagation

##### **Natural populations “with minimal genetic contribution from hatchery fish”**

Artificial propagation programs for coho salmon were historically, and are currently, in almost all of the basins within the lower Columbia River basin. There are no populations that are likely to be subject to minimal or less genetic influence from hatchery-origin fish. Data is missing for a number of populations and it is unknown if they would meet the criteria.

##### **Natural<sup>a</sup> populations “that are stable or increasing, are spawning in the wild, and have adequate spawning and rearing habitat”<sup>b</sup>**

There are no populations that meet the criteria.

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<sup>a</sup> See HLP for definition of natural, mixed and hatchery populations

<sup>b</sup> HLP Point 3



### **Mixed (Integrated Programs<sup>c</sup>)**

Mixed (aggregate natural and hatchery-origin) coho populations in the ESU are: Grays River, Big Creek, Elochoman River, Upper Cowlitz River, Lower Cowlitz River, North Fork Toutle River, North Fork Lewis River, Clackamas River, Sandy River, and Lower Gorge Tributaries.

### **Hatchery (Isolated<sup>d</sup>)**

There are number of programs that release hatchery fish that are part of the ESU but are not part of the population where the fish are released: CEDC Coho Salmon Program - Youngs Bay, Astoria High School STEP Coho Program, Warrenton High School STEP Coho Program, CEDC Coho Program - Tongue Point/Blind Slough, Steamboat Slough Net Pens, Kalama River Type-N Coho Program, Kalama River Type-S Coho Program, Clark PUD Type-N Coho Program, Dist. 5 Firefighters Type-N Coho Program, Syverson Project Type-N Coho Program, Washougal Type-N Coho Program and Little White Salmon /Willard NFH Coho Program.

## **19.3.2 Summary of ESU Viability**

**Abundance** Estimated natural-origin returns and the total number of natural spawners (i.e., the combination of natural-origin and hatchery-origin chinook included in the ESU) are listed in Table X. However, average total (aggregate natural and hatchery-origin coho salmon) escapements to natural spawning areas for the most recent years, though increasing, remain well below historical levels as estimated by EDT analysis. Abundance trends for the Sandy River and Clackamas River populations are still trending slightly negative. The high proportion of hatchery-origin coho spawning naturally indicates that many populations are being sustained by hatchery fish and there is little information to indicate they would naturally persist in the long term (BRT 2003). Abundance information is not available for the many populations.

**Productivity** There are no data indicating hatchery programs have increased ESU productivity. In the BRT (2003) analysis, when it was assumed that hatchery-origin adults contributed to the natural spawning population, productivity estimates for those populations declined.

**Spatial Structure** The risk to the spatial structure of the ESU has been reduced by the re-introduction program in the Upper Cowlitz River. The other integrated programs have supported the maintenance of the ESUs spatial structure by providing natural spawners.

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<sup>c</sup> Integrated programs follow practices designed to promote and protect genetic diversity and only use fish from the same local population for broodstock (both natural-origin fish, whenever possible, and hatchery-origin fish derived from the same local population and included in the ESU). Programs operated to protect genetic diversity in the absence of natural-origin fish (e.g., captive broodstock programs and the reintroduction of fish into vacant habitat) are considered “integrated”.

<sup>d</sup> Isolated programs do not follow practices designed to promote or protect genetic diversity. Fish that are reproductively isolated are more likely to diverge genetically from natural populations included in the ESU and to be excluded themselves from the ESU.

**Diversity** The integrated propagation programs appear to be preserving some coho stock structure. However, most of those programs have incorporated fish from other populations to meet production goals which has tended to reduced diversity. The BRT (2003) observed that collectively the hatchery programs contain a great deal of genetic resources that might be tapped to help promote restoration of more widespread naturally spawning populations.

### **19.3.3 Artificial Propagation Record**

**19.3.3.1 Experience with Integrated Programs** Many of the integrated programs within the ESU have been in operation for decades. However, most of these programs did not follow practices designed to promote and protect genetic diversity as fish from other basin even other ESUs were incorporated. Many coho programs in the past did not actively integrated natural-origin fish because only a small portion of the hatchery-origin adults were externally marked. Programs probably did incorporated natural-origin adults into the broodstock because they could not be distinguished from hatchery coho. Currently all hatchery production is adipose fin-clipped which will allow for identification of natural-origin coho when collecting broodstock and when monitoring escapement.

**19.3.3.2 Are Integrated Programs Self-Sustaining** Program management now requires that all of the integrated programs be self-sustaining, restricting the practice of using production from other programs to back fill shortfalls. This has not been a concern with abundant returns observed in recent years.

**19.3.3.3 Certainty that Integrated Programs will Continue to Operate** The Cowlitz River basin programs are funded by Tacoma Power Utilities as mitigation for impacts from the construction and operation of the hydro-system on the Cowlitz River. Funding of these programs is required under the FERC license, but programs will change if natural production is established above the dams. The programs in the Lewis River basin are funded by Pacifcorp as mitigation for impacts from the construction and operation of dams on the North Fork Lewis River. Funding of these programs is required under the FERC license, but programs will likely change during the current relicensing process. The CEDC net pen programs, and the Grays River Coho Program are funded by the BPA through the Fish and Wildlife Program. These programs will go through periodic review and could lose funding if priorities change or BPA reduces funding to the Fish and Wildlife Program. The Mitchell Act funds a number of programs: Big Creek Coho, Elochoman River Type-S Program, Elochoman River Type-N Program, Cathlamette High School FFA Type -N Coho Program, North Toutle Type-S Coho Program, Sandy River Coho Program, and Bonneville/Cascade/Oxbow Coho Salmon Program. Mitchell Act funding has continued to decline over time and future funding of these programs is uncertain. The Sea Resources program is funded through Federal and state grants and community donations and the future funding of this program is uncertain.

#### 19.3.4 Summary of Overall Extinction Risk Faced by the ESU

The overall abundance of the ESU has increased, but the majority of the naturally spawning coho are hatchery-origin. Natural spawning populations (both natural and hatchery) are still well below historical abundances. The Cowlitz River basin re-introduction program is attempting to increase the spatial distribution of the LCR coho salmon ESU, but self sustaining populations have not been established. The integrated programs are operating to preserve the genetic diversity remaining in the ESU. The BRT concluded that the hatchery programs contain a great deal of genetic resources that might be tapped to help promote restoration of more widespread naturally spawning populations.

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